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Toxics Use Reduction Case Study

HOWARD H. SWEET ELIMINATES EMISSIONS OF FIVE CHEMICALS

SUMMARY

Howard H. Sweet and Son, Inc. has implemented production line changes that have eliminated use of two toxic substances -- trichloroethylene and ozone-depleting Freon -- while ending the emission of three other toxic substances: nitric acid, sulfuric acid and cyanide. As of the end of 1992, these toxics use reduction (TUR) efforts had succeeded in changing the company's regulatory status from a small quantity generator (SQG) of hazardous wastes to a very small quantity generator (VSQG), releasing them from an array of strict controls on waste storage, treatment and transportation. In addition, these changes have elminated the purchase of 825 gallons per year of toxic chemicals and generated an average annual savings of more than $40,000.

BACKGROUND

Howard H. Sweet and Son is a 125-employee jewelry manufacturer specializing in the production of silver, gold and gold-filled beads, and chains. The company's operations encompass the design and manufacture of the working parts for its own chain-making machines, the stamping of flat stock and tubing, the production of beads and chains, and the soldering, plating and assembly of finished jewelry.

Howard Sweet joined the pollution prevention movement quite early, installing a closed-loop metals recovery system for gold and copper plating in the mid-1980s. This investment in closed-loop plating lines effectively spared the company the necessity of installing an expensive new wastewater treatment system, saving more than $100,000 in capital costs and an additional $140,000 in annual operating costs.

TOXICS USE REDUCTION PLANNING

Partly because of the impressive environmental and economic benefits of its first pollution prevention project, Howard Sweet has continually sought new ways to reduce its use of toxic substances and/or its generation of toxic byproducts. This search has been spearheaded by an in-house TUR planning team, which has investigated the company's chemical use patterns and devised ways to reduce or eliminate the use or the emission of almost every toxic substance on the premises.

At present, the only toxic chemical whose use Howard Sweet must report to regulatory authorities, either on the federal Form R or the state Form S, is anhydrous ammonia. The TUR team has consulted with vendors, other companies, and a state-certified TUR Planner in an effort to replace this chemical, which gives luster to its finished products. No suitable alternative has yet been identified.

TOXICS USE REDUCTION MODIFICATIONS

Howard Sweet's TUR efforts have permitted the company to eliminate use of two toxic substances -- trichloroethylene (TCE) and Freon. The company's TUR team also has implemented production line changes to reduce cyanide use, and to cut back on the consumption or emission of several other chemical substances.

TCE: TCE was used as a degreaser to clean buffing compound from polished jewelry. Howard Sweet began to phase out TCE in 1990, and eliminated its use entirely in August 1991. Prior to the phase-out, the company had used nine 55-gallon drums per year of TCE, a volatile organic compound that contributes to ground-level ozone (i.e. smog).

Many jewelers have continued to use TCE because it is very effective in removing grease-based buffing compounds. Howard Sweet paved the way for elimination of TCE by switching to a water-based buffing compound, making possible the effective use of aqueous cleaners.

Howard Sweet eventually settled on a heavy-duty water-based cleaner known as 815 QR. Howard Sweet paid $2,970 for TCE in 1990. Since switching to 815 QR, cleaner purchase costs have been cut by $150 per year. The switch has also saved the company $1,100 per year in Form S filing fees, while eliminating a significant threat to worker health and the environment.

Freon: In April of 1990, Howard Sweet eliminated the use of Freon, an ozone-depleting chlorofluorocarbon (CFC) that is slated for phase-out under federal law by the end of 1995. The Freon, which had been used for drying, was replaced by a forced hot-air electrical dryer.

The total cost of the dryer replacement was $9,500. Prior to the change, the company had consumed 330 gallons per year of Freon at an annual cost of $29,187. Freon costs have risen

sharply since then, and the company would have spent approximately $60,000 for a comparable amount of Freon in 1995. The cost of operating the dryer is $350 per year.

Cyanide: Howard Sweet has cut back significantly on the use of cyanide for bright-dipping of precious metal beads. In the traditional bright-dipping process, baskets of precious metal beads are processed in a concentrated cyanide-peroxide solution. When the solution is spent, the precious metals are plated out of it and it is discharged for conventional cyanide destruction.

Howard Sweet's TUR team determined that the best way to reduce the use of cyanide was to replace bright-dipping with a bright-annealing process, which would give the same luster and cleanliness to gold surfaces. The company was able to use existing annealing equipment to accomplish the bright-annealing process. This process change did not require the use of additional chemicals. The new annealing process cannot be used for all jewelry pieces, but it has permitted the company to cut consumption of cyanide considerably.

Nitric and Sulfuric Acids: The company also found a way to eliminate its emission of nitric acid and sulfuric acid: spent acids are now used as pH adjusters in the wastewater neutralization process.

Other Pollution Prevention Efforts: Building on its past success with closed-loop gold and copper plating systems, Howard Sweet installed a closed-loop recovery system for silver. The company reports savings of $6,100 annually since this system was put in place. In addition, after a manufacturing process review, Howard Sweet found that its nickel solution and bath could be eliminated.

Howard Sweet has begun to recover rhodium in its on-site wastewater treatment process, so that it can be sold as scrap metal. This step has helped the company to eliminate its production of sludge. Currently, the facility discharges only water and oil.

In the chain department, Howard Sweet has substituted nitrogen for the argon gas formerly used in soldering. Finally, the company has begun to recycle soaps wherever possible throughout the facility.

RESULTS

Reductions Achieved: Eight years of continual TUR efforts have led to impressive reductions in Howard Sweet's consumption and emission of toxic substances. The company has eliminated the annual use of 495 gallons of TCE and 330 gallons of Freon. Cyanide use has been reduced by 90%, and the company no longer emits nitric acid or sulfuric acid. As a result of its TUR projects, Sweet has been reclassified as a very small quantity generator of hazardous wastes, meaning that it is now subject to more lenient regulatory control of waste storage, treatment and transportation.

Economics: Howard Sweet's TUR program has had a very favorable impact on the bottom line. By eliminating the use or emissions of several chemicals, the company has saved thousands of dollars on the purchase, handling, transportation, disposal, regulation, and liability costs associated with the use of toxic chemicals. The most dramatic savings have come from the early phase-out of Freon use. This move alone saved Howard Sweet at least $200,000 in chemical purchase costs during the period 1989-1995. It has also spared the company from having to label its products with an indication that they were manufactured with ozone-depleting substances. Such labels might have had an adverse impact on sales.

This case study is one in a series prepared by the Office of Technical Assistance (OTA), a branch of the Massachusetts Executive Office of Environmental Affairs. OTA's mission is to assist industry in reducing the use of toxic chemicals and/or the generation of toxic manufacturing byproducts. Mention of any particular equipment or proprietary technology does not represent an endorsement of these products by the Commonwealth of Massachusetts. This information is available in alternate formats upon request. OTA's ***confidential, nonregulatory*** *services are available at* ***no charge*** *to Massachusetts businesses and institutions that use toxics. For further information about this or other case studies, or about OTA's technical services, contact:* ***Office of Technical Assistance, 100 Cambridge Street, Room 2109, Boston, Massachusetts 02202; phone #(617)727-3260; fax #(617)727-3827; electronic bulletin board #(617)727-5621.***